

RECOVERY PLAN

Apalachicola Rosemary

(*Conradina glabra*)



U.S. Fish and Wildlife Service
Southeast Region
Atlanta, Georgia

Recovery Plan
for
Apalachicola Rosemary
(*Conradina glabra*)

Prepared by

Southeast Region
U.S. Fish and Wildlife Service
Atlanta, Georgia



Approved: John R. Eadie
Acting Regional Director, U.S. Fish and Wildlife Service

Date: 9/27/94

DISCLAIMER

Recovery plans delineate reasonable actions that are believed to be required to recover and/or protect listed species. Plans are published by the U.S. Fish and Wildlife Service, sometimes with the assistance of recovery teams, contractors, State agencies, and others. Objectives will be attained and any necessary funds made available subject to budgetary and other constraints affecting the parties involved, as well as the need to address other priorities. Recovery plans do not necessarily represent the views nor the official positions or approval of any individuals or agencies involved in formulating the plan, other than the U.S. Fish and Wildlife Service. Recovery plans represent the official position of the U.S. Fish and Wildlife Service **only** after they have been signed by the Regional Director or Director as **approved**. Approved recovery plans are subject to modification as dictated by new findings, changes in species status, and the completion of recovery tasks.

Literature citations should read as follows:

U.S. Fish and Wildlife Service. 1994. Recovery Plan for Apalachicola Rosemary (*Conradina glabra*). Atlanta, GA. 17 pp.

Additional copies of this plan may be purchased from:

Fish and Wildlife Reference Service
5430 Grosvenor Lane, Suite 110
Bethesda, Maryland 20814

Telephone: 301/492-6403 or 1-800/582-3421

Fees for recovery plans vary, depending upon the number of pages.

Acknowledgement:

The cover illustration was done by Noah Lowenthal.

EXECUTIVE SUMMARY

Current Species Status: *Conradina glabra* (Apalachicola rosemary) is listed as an endangered species, primarily due to habitat loss and modification of forestry practices.

Habitat Requirements and Limiting Factors: *Conradina glabra* was originally restricted to a specialized habitat, the edges of steephead ravines, and possibly to upland pine-wiregrass vegetation. Recently, the plant has been found in disturbed areas such as highway and utility rights-of-way.

Recovery Objective: Downlist *Conradina glabra* to threatened status when recovery criteria are met.

Recovery Criteria: To protect existing populations of *C. glabra* through habitat acquisition, prescribed burning, and management of rights-of-way. Reclassification to threatened can be considered if five geographically distinct, self-sustaining populations are protected and managed throughout its historic range.

Major Actions Needed:

- (1) Protect existing populations by:
 - encouraging private landowners to use forestry practices to promote this plant;
 - annual monitoring and mapping of populations;
 - managing rights-of-way for this plant; and,
 - acquiring habitat on private lands.
- (2) Study biology of populations to:
 - determine beneficial prescribed burning regimes for this plant;
 - examine life history such as reproductive strategy and capacity, seed viability, seedling establishment, and whether the plants spread by rhizomes; and,
 - search for additional populations in Liberty County, particularly in the Apalachicola National Forest.
- (3) Conduct genetic studies to:
 - determine genetic variability within populations, particularly those which are protected and managed.
- (4) Propagation and reintroduction where appropriate and feasible.

Estimated cost (\$000's) of recovery:

Year	Need 1	Need 2	Need 3	Need 4	Total
FY1	10	19	0	2	31
FY2	10	15	10	2	37
FY3	10	15	10	2	37
FY4	10	6	0	2	18
FY5	10	6	0	2	18
Total	50	61	20	10	141

Date of Recovery: The possibility of recovery depends on voluntary cooperation of landowners and/or successfully protecting sites through purchase or easements.

TABLE OF CONTENTS

I. INTRODUCTION	1
A. INTRODUCTORY INFORMATION	1
Listing and Ecosystem Background	1
Taxonomy, Description, and Distribution	1
B. THREATS	5
Habitat destruction and modification	5
Commercial and Recreational Harvest	6
C. EXISTING CONSERVATION MEASURES	6
D. STRATEGY FOR RECOVERY	7
II. RECOVERY	9
A. RECOVERY OBJECTIVE AND CRITERIA	9
B. OUTLINE FOR RECOVERY ACTIONS ADDRESSING THREATS	9
C. REFERENCES	11
III. IMPLEMENTATION SCHEDULE	13
IV. LIST OF REVIEWERS	16

PART I. INTRODUCTION

A. INTRODUCTORY INFORMATION

Listing and Ecosystem Background

Resembling the Mediterranean herb rosemary (*Rosmarinus officinalis*), *Conradina* (minty rosemary) is a genus of minty-aromatic shrubs which belong to the mint family (Lamiaceae or Labiatae). *Conradina* is characterized by dense hairs appressed or matted on the under surfaces of the leaves, and by the flower's corolla tube, which is sharply bent above the middle, rather than straight or gently curved (Shinners 1962).

The genus *Conradina* consists of six allopatric species, i.e., the ranges of the species do not overlap (Kral and McCartney 1991). The most widespread and variable species is *Conradina canescens* of the Florida panhandle, southern Alabama, and southern Mississippi. This species occurs on dry sand soils on coastal dunes, in sand scrub vegetation, and in dry longleaf pinelands. The other five species have more restricted geographic distributions and are considerably less variable (Gray 1965).

Conradina verticillata (Cumberland rosemary) is a federally threatened species native to north-central Tennessee (U.S. Fish and Wildlife Service 1991). *C. grandiflora* (large-flowered rosemary) native to Florida's scrub vegetation along the Atlantic coast is not federally listed, but is considered rare. The other three species of *Conradina* are all listed as federally endangered species: *C. glabra* (Apalachicola rosemary), *C. brevifolia* (short-leaved rosemary), and *C. etonia* (Etonia rosemary). This recovery plan concerns only *Conradina glabra* which was listed as an endangered species on July 12, 1993 (U.S. Fish and Wildlife Service 1993).

Taxonomy, Description, and Distribution

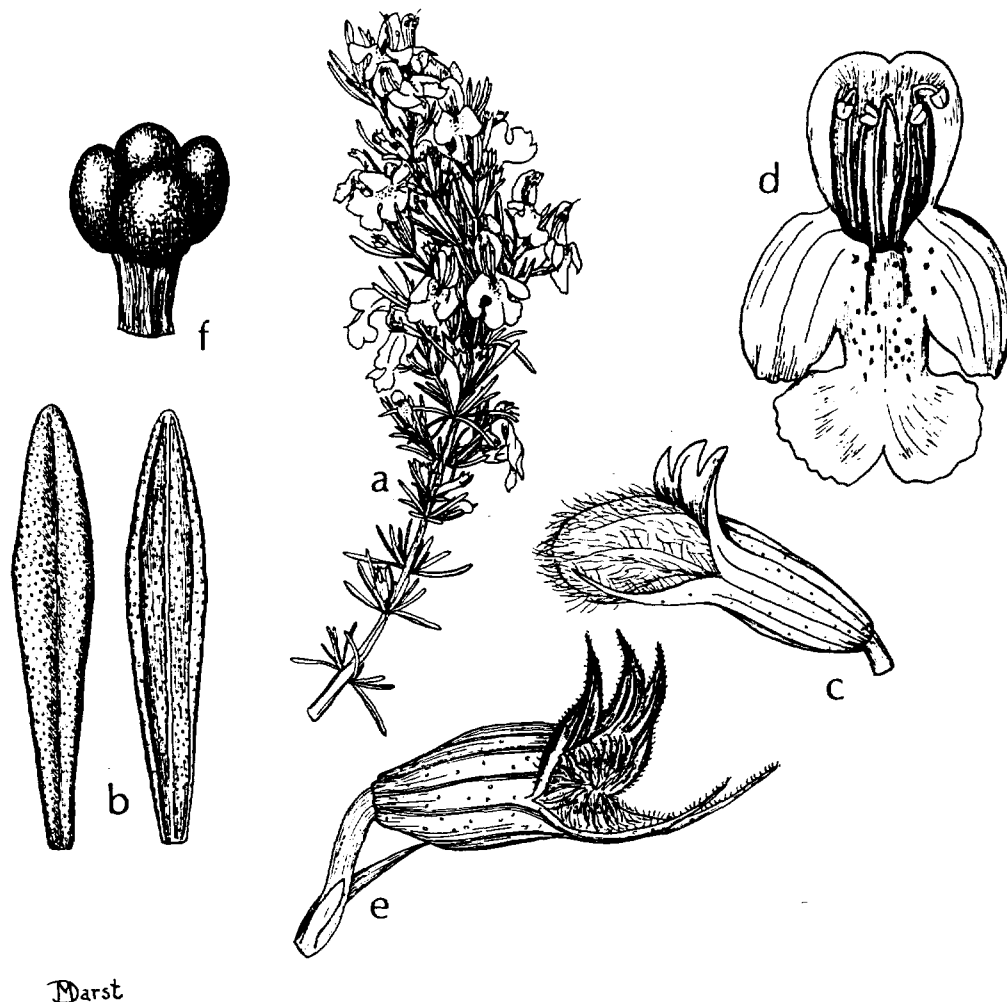
Conradina glabra was named as a distinct species by Shinners (1962), a treatment that was upheld by Gray (1965) and Kral and McCartney (1991). The plant had first been collected in 1931, and Small (1933, p. 1167) mentioned the specimen without assigning a name. *Conradina glabra* is a much-branched shrub up to 2 meters tall. Kral (1983) noted that it is "often clonal" and Wilson Baker (pers. comm. cited in Schultz 1987) thinks the species may spread by rhizomes; however, Dr. Ann Johnson (pers. comm. Florida Natural Areas Inventory [FNAI]) has noted that woody mints, including *Conradina brevifolia* and *Calamintha ashei*, are killed by fire and come back from seed. Regrowth from rhizomes has never been observed. She suggests that some excavation of roots of *Conradina glabra* should be performed to confirm that it is rhizomatous, rather than simply tending to occur in a clumped distribution pattern.

The branches of *C. glabra* are spreading or upright. The leaves are evergreen, opposite, with additional leaves in short shoots in the axils giving the appearance of fascicles. The leaves are needle-like, "very similar to the needles of fir" (Kral 1983, p. 949). The leaves are hairless on the upper surface—the only species of *Conradina* for which this is the case. *Conradina glabra* flowers from March to June and then intermittently until frost (Kral 1983). The flowers are usually in groups of two or three. The calyx and corolla are two-lipped.

The corolla is 1.5 to 2.0 centimeters (0.5 to 0.75 inches) long from its base to the tip of its longest lobe, with a slender corolla tube that is straight for about 5 millimeters (mm) long, then bends sharply downward to form a funnel-shaped throat 5 mm long, then widens out into upper and lower lips. The outside of the tube and throat are white, with the lobes and lips lavender blue at the tips. The lower lip of the corolla is three-lobed, with a band of purple dots extending along its inner side. The four stamens are paired. Many flowers are male sterile. In extreme cases, the stamens are "grossly malformed, being petaloid in shape, texture, and color. A less bizarre manifestation of male sterility is that in which only aborted pollen grains are contained in anthers that appear completely normal" (Gray 1965). Male sterility may be the result of inbreeding and homozygosity (Gray 1965). The plant is illustrated in Godfrey (1988) and reproduced in Figure 1.

Conradina glabra is restricted to Liberty County, Florida, west of Tallahassee near the Apalachicola River (Gray 1965; Schultz 1987, citing personal communication from Wilson Baker; and S. Gatewood, The Nature Conservancy (TNC), Tallahassee, pers. comm., 1991). Plants collected from Santa Rosa County near Milton, northeast of Pensacola (by S.C. Hood in 1949) were assigned to this species by Shinnars (1962). Gray (1965) searched the Milton area for *Conradina glabra* without finding it. Later, Godfrey (1988) found plants assignable to *C. glabra* north of Milton, in Blackwater State Forest. Martin (1992) considered the Milton plants to be *C. glabra* in her genetic study. The Blackwater Forest plants are within the geographic range of the widespread, variable *C. canescens* and, except for being glabrous, the Santa Rosa County plants resemble *C. canescens* more than *C. glabra*. Kral and McCartney (1991) implicitly assign the Blackwater plants to *C. canescens*. Godfrey (1988) corrects an erroneous report by Godfrey and Ward (1979) that "most collections [of *C. glabra*] have been made in or near the Apalachicola National Forest" in Franklin County, Florida. The plant does not occur in the National Forest or Franklin County.

Conradina glabra occurs in an area of several square miles northeast of Bristol, Liberty County (Figure 2). The area is a gently undulating upland, originally with longleaf pine-wiregrass vegetation, dissected by ravines of the Sweetwater Creek system, which drain westward to the Apalachicola River. Parts of the Apalachicola ravines are incorporated in public and private nature preserves that protect rich hardwood forests with the narrowly endemic Florida torreya (*Torreya taxifolia*, also federally listed as endangered) and Florida yew (*Taxus floridana*). Heads of ravines, called steepheads, have slopes that are undermined by groundwater seeping into the ravine bottom, causing the slopes to gradually slump, carrying the vegetation with it. At least one steephead shrub, Florida yew, appears to be adapted to slowly moving down the slopes (Redmond 1984, cited in Platt and Schwarz 1990), and *C. glabra* may sometimes be carried into ravines. "Many older *Conradina* shrubs occur at the edge of the ravine and even extend a short distance down into open areas of the ravine; younger *Conradina* plants have become established in the barren, exposed soil adjacent to the pines and often extend into the pine stand. This suggests that *C. glabra* is able to compete effectively in open, newly exposed areas but is unable to compete in closed stands of mixed hardwoods or pines. This species probably features significantly in secondary plant



Darst

Figure 1. a-f, *Conradina glabra*: a, flowering branch; b, enlargements of leaf, upper surface on left, lower surface to right; c, flower, just before anthesis; d, flower, face view; e, fruiting calyx; f, nutlets.

Reproduced from Robert K. Godfrey, *Trees, Shrubs, and Woody Vines of Northern Florida and Adjacent Georgia and Alabama*. © 1988 by The University of Georgia Press, Athens. Illustrations by Melanie Darst, © 1988 by Robert K. Godfrey.

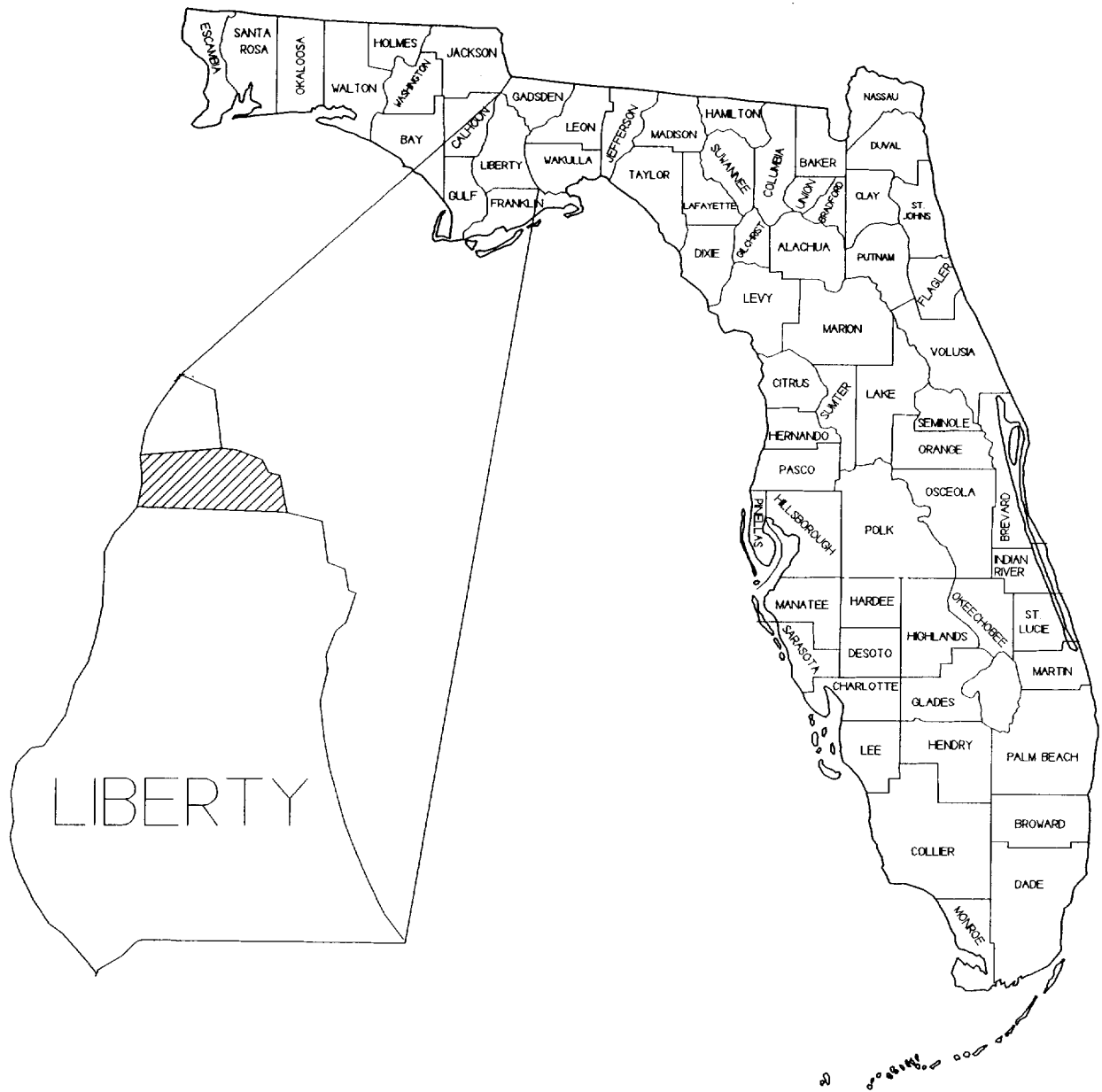


Figure 2. Distribution of *Conradina glabra*, *Apalachicola rosemary*.

succession in the area, much of which is frequently subjected to burning" (Gray 1965). Wilson Baker (pers. comm. cited in Schultz 1987) suggested that *Conradina* spread from the ravine edges into newly planted pine plantations on the uplands during the 1950's. Kral (1983) considered *C. glabra* to have inhabited the grassy understory of the upland longleaf pine-wiregrass vegetation before pine plantations were developed, as well as steephead edges. Kral thought that *C. glabra* was increasing in slash pine plantations, along with another woody mint, *Calamintha dentata*. However, Kral thought it "premature to state that this will be a stable system" because the planted slash pine had not thrived, the plantations were probably more open than had been intended, and that if the slash pines matured, they might provide "more shade and more competition than is good for the *Conradina*". Most of the slash pine was cut in 1987 and replanted to sand pine (S. Gatewood, TNC, *in litt.*, 1987). *Conradina glabra* currently "is found on road edges, in planted pine plantations and along their cleared edges, and along the edges of the ravines" (Baker, pers. comm., in Schultz 1987). A recent (1993) survey along the Florida Gas Transmission pipeline found an estimated 10,000 plants, artificially divided into six populations. The plants appeared to be thriving in the exposed soil along the pipeline (Biological Assessments, Florida Gas Transmission Company, Phase III Natural Gas Pipeline Expansion Project, 1993). Additionally, a new population was discovered east of State Highway 12 (R. Hilsenbeck, pers. comm.).

At the present time, FNAI lists seven natural populations of *Conradina glabra*, six of them on land owned by a forest products company and on public road rights-of-way. The seventh, a protected population, was documented at Torreya State Park but has not been relocated. An additional population is being established a short distance (2.5 kilometers) [km] from two of the extant populations, on similar ravine edges, in the Apalachicola Bluffs and Ravines Preserve (ABRP), owned by TNC (S. Gatewood, TNC, pers. comm., 1991). Since initiation of this project, two small, naturally occurring populations have been discovered on the Preserve (D. Gordon pers. comm.).

B. THREATS

Habitat destruction and modification.

Conradina glabra is a narrowly distributed species that was originally restricted to a specialized habitat, the edges of steephead ravines, and possibly also to upland longleaf pine-wiregrass vegetation. The plant appears to require full sunlight or light shade. Planted pine trees are likely, by the time they mature, to produce dense shade that could kill this species. Another possible problem in planted pine stands is that sand pine (which is currently grown in the area) does not tolerate prescribed fire, which may help keep habitat open for *C. glabra*. Other *Conradina* species grow in habitats with varying natural fire frequencies. Forestry practices may kill *C. glabra* directly: S. Gatewood (TNC, memorandum, 1987, provided by FNAI) reported that when most of the range of this plant was cut and site-prepared in 1987, he observed some *C. glabra* plants surviving on areas where chopping had not occurred, none where it had. The long-term consequences of the 1987 activity is not yet known; planting of slash pines in the area may have allowed *C. glabra* to spread through the

plantations and onto road rights-of-way, but the site preparation methods used then were probably different from those in use today, and the slash pines never thrived well, casting less shade than can be expected of sand pines. The herbicide hexazinone (Velpar[®]) is sometimes used in timber regeneration areas (S. Gatewood, TNC, memorandum, May 1987), and its use could affect *C. glabra*. The very limited distribution of *C. glabra*, and management of most of that range by a single landowner exacerbates the threat to this plant from forestry practices, simply because the same management practices are likely to be applied rangewide. Some land with *C. glabra* has been converted to improved pasture, destroying the plant (Kral 1983) and rendering the land uninhabitable for it.

Commercial and Recreational Harvest

There is commercial trade in the genus *Conradina*, whose species have considerable horticultural potential. Robert McCartney (pers. comm. Woodlanders, Inc., Aiken, SC) (cited in U.S. Fish and Wildlife Service 1991) reports that all the species of *Conradina* are easily propagated and are in cultivation. The Woodlanders nursery catalog shows that the widespread, variable *Conradina canescens* is a rich source of horticultural selections, and it appears to be the species of greatest horticultural interest. Commercial trade of *Conradina* species should not adversely affect *C. glabra*, provided that trade is dependent upon cultivated plants. Inappropriate collecting from plants in the wild is a threat to *C. glabra*.

C. EXISTING CONSERVATION MEASURES

Conradina glabra is listed as a threatened species on the Florida Regulated Plant Index (Florida Department of Agriculture and Consumer Services Rule Chapter 5B-40). The list was formerly part of the Preservation of Native Flora of Florida law (section 581.185-187, Florida Statutes). The Regulated Plant Index regulates taking, transport, and sale of plants but does not provide habitat protection. The Endangered Species Act (Act) provides additional protection through Sections 7 and 9, recovery planning, and the Act's additional penalties for taking of plants in violation of Florida law. The Florida law provides for automatic addition of federally listed plants to the State's list of endangered species.

Enforcement of the Endangered Species Act's trade prohibitions on *Conradina glabra* could be difficult because *Conradina canescens*, a widespread, secure species, is morphologically variable, and some individuals belonging to this species may be indistinguishable from individuals belonging to *C. glabra*. *Conradina glabra* is not presently threatened by taking for horticultural trade. Information available to the Service indicates that *Conradina* plants in trade are of cultivated origin. It is anticipated that trade permits will be sought and issued for members of the genus *Conradina* because at the time of listing every member of the genus was in commerce across State lines.

Conservation measures provided to species listed as endangered or threatened under the Act include recognition, recovery actions, requirements for Federal protection, and prohibitions against certain practices. Recognition through listing encourages and results in conservation actions by Federal, State, and private agencies, groups, and individuals. The Endangered

Species Act provides for possible land acquisition and cooperation with the States and requires that recovery actions be carried out for all listed species. The protection required of Federal agencies and the prohibitions against certain activities involving listed plants are discussed, in part, below.

Section 7(a) of the Act, as amended, requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened and with respect to its critical habitat, if any is designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR Part 402. Section 7(a)(2) requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of such a species or to destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into formal consultation with the Service.

At the time this recovery plan was prepared, The Nature Conservancy had already established *C. glabra* at three new sites on ABRP. The new populations were established using cuttings of *C. glabra* plants within 3 km of the Preserve (Gordon 1993). TNC is conducting studies on the effects of shading and burning to the growth of *C. glabra*. Preliminary results indicate that *C. glabra* growth and reproduction were enhanced in disturbed conditions, i.e., when released from competition, and that the natural fire frequency that resulted in relatively open pine savannas in sandhill communities, may have allowed persistence of this species (Gordon 1993).

Recent electrophoretic investigations of *C. glabra* indicate that the species maintains levels of within-population variation greater than mean values reported for angiosperms, and higher than would be expected for a species with a highly restricted distribution (Martin 1992). Additionally, a phylogenetic analysis of *C. glabra* is being conducted at the University of Georgia (R. Crook pers. comm).

D. STRATEGY FOR RECOVERY

Conservation measures on road and utility rights-of-way may offer opportunities for conserving *Conradina glabra*. Florida Department of Transportation (FDOT) is interested in maintaining existing populations along roadsides. Another conservation measure is ensuring that use of herbicides in forestry or road right-of-way maintenance does not jeopardize this plant. An attempt is currently being made to acquire 10,000 acres of existing *C. glabra* habitat in Liberty County through the Florida Conservation and Recreation Lands (CARL) program. The acreage includes steepheads and surrounding forests in the Sweetwater Creek system. Also, the Florida Department of Environmental Protection, Division of Recreation and Parks has proposed to (1) search for the missing populations of *C. glabra* at Torreya State Park on appropriate habitat sites; (2) investigate the feasibility of reintroducing this species where it does not occur on the Park; and, (3) cooperate in research projects to determine the effects of prescribed burning on this species.

Cooperative management opportunities for private landowners exist through the Service's Partners for Wildlife program. The Partners program improves wildlife habitat on private lands through alliances between the Service, other organizations, and individuals or corporations, while leaving the land in private ownership. The Service is available to provide technical and funding assistance to landowners. Agreements between the Service and a landowner remain in effect for a minimum of 10 years (Habitat Development Agreement) but can be modified or canceled at any time. Because most *Conradina glabra* habitat occurs on private land, the Partners for Wildlife program may be beneficial to the recovery of this species.

PART II. RECOVERY

A. Recovery Objective and Criteria

The immediate goal of this recovery plan is to preserve *Conradina glabra* from extinction by maintaining naturally-reproducing wild populations on appropriate sites. Since the plant occurs naturally on only six to eight sites, conservation of existing habitat is crucial. Propagation and research on the protected artificial populations also is extremely important to the recovery of *C. glabra*.

Downlisting may be considered when five populations are protected and under stable management. Protection is defined as populations occurring on public land or under permanent conservation easement. These recovery goals will be refined as recovery tasks are implemented, resulting in better information on the needs of this species.

B. Outline for Recovery Actions Addressing Threats

1. Protect existing populations.

- 1.1 **Encourage conservation of existing populations on private lands.** Six naturally occurring populations are on lands owned by St. Joseph Land and Development Company. This company should be encouraged to maintain these populations because they are extremely important for the continued existence of *C. glabra*. Cooperative management opportunities with private landowners exist through the Service's Partners For Wildlife program.
- 1.2 **Conduct annual mapping and monitoring of all known populations of *C. glabra*.** Systematic monitoring of known populations should be done annually (only after written permission is obtained from private landowners). Monitoring plans for natural and introduced populations should include and emphasize seedling production and survival. In areas disturbed by fire or recent silvicultural activity, monthly surveys should be conducted.
- 1.3 **Manage rights-of-way.** Populations of *C. glabra* along highway and utility rights-of-way appear quite vigorous. Management of these habitats may provide additional areas in which to propagate *C. glabra*. FDOT is willing to support conservation of native vegetation on roadsides; a roadside management plan should be developed. Test plots to determine the optimum mowing regime (i.e. when and how often) need to be established and studied over time. Another management opportunity is to ensure that the use of herbicides in forestry or road right-of-way maintenance does not jeopardize this plant.
- 1.4 **Acquire habitat.** The Florida Department of Agriculture and Consumer Services, Division of Forestry is making an attempt to acquire 10,000 acres of existing

Conradina glabra habitat in Liberty County through the state's CARL program. Plant conservation can often be achieved on small tracts of land, so it may be worthwhile to seek conservation easements to protect *C. glabra*.

2. Conduct Population Biology Studies.

2.1 Study the effects of prescribed fire and forest management practices.

Research needs to determine how varying prescribed burning schedules affect growth and maintenance of *Conradina glabra* populations. Additional studies of shading and competition are being conducted by TNC on the ABRP to facilitate establishment of the plant on ABRP and/or CARL lands.

2.2 Conduct life history studies. Needed information on *Conradina glabra* includes reproductive strategy and capacity, seed viability, seedling establishment, and whether the plants spread by rhizomes.

2.3 Survey for *Conradina glabra* outside its current range. A field search should be conducted during spring when the maximum number of plants are flowering. The Liberty County area should be searched for additional populations, particularly on suitable habitat in Apalachicola National Forest. Leonard and Baker (1982) suggested looking as far north as southern Alabama and Georgia where similar dry habitat occurs.

3. Conduct genetic studies. Research is needed to determine genetic variability within reintroduced populations. This research will ensure that reintroduced populations have genetic variability similar to natural populations to withstand drought, diseases, etc.

4. Propagate *Conradina glabra* and reintroduce and/or augment populations within its historic range. Establishment of the artificial population on ABRP shows that *C. glabra* can be propagated and introduced rather easily. If necessary, additional reintroductions could take place on protected sites within the historic range of the plant.

C. REFERENCES

- Godfrey, R.K. 1988. *Conradina glabra*. pp. 405-407, *Calamintha dentata*. pp. 401-403, in Trees, shrubs, and woody vines of northern Florida and adjacent Georgia and Alabama. Univ. of Georgia Press, Athens.
- _____, and D.B. Ward. 1979. Apalachicola rosemary. Page 81 in Rare and endangered biota of Florida. Vol. 5: Plants, D.B. Ward, ed. Univ. Presses of Florida, Gainesville.
- Gordon, D. 1993. Responses of two rare species to manipulation: Effects of fire on *Matelea alabamensis* and effects of transplanting and shade on *Conradina glabra*. FL State Office of The Nature Conservancy, Tallahassee. Unpublished final report.
- Gray, T.C. 1965. A monograph of the genus *Conradina* A. Gray (Labiatae). Unpublished Ph.D. Thesis, Vanderbilt University. 189 pp.
- Kral, R. 1983. A report on some rare, threatened, or endangered forest-related vascular plants of the South. USDA Forest Service Tech. Publ. R8-TP 2. 2 vols., 1305 pp.
- _____, and R.B. McCartney. 1991. A new species of *Conradina* (Lamiaceae) from northeastern peninsular Florida. Sida 14:391-398.
- Leonard, S.W., and W.W. Baker. 1982. Biological survey of the Apalachicola Ravines biotic region of Florida. FL State Office of The Nature Conservancy, Tallahassee. Unpublished report.
- Martin, E.L. 1992. Patterns of genetic diversity in the rare mint *Conradina glabra* and its nearest relative *Conradina canescens*. M.S. Thesis, Univ. of West Florida.
- Platt, W.J., and M.W. Schwartz. 1990. Temperate hardwood forests. Pages 194-229 (Florida yew, p. 208) in Ecosystems of Florida, R.L. Myers and J.J. Ewel, eds., Univ. of Central Florida Press, Orlando. xviii + 765 pp.
- Redmond, A.M. 1984. Population ecology of *Taxus floridana*, a passively cloning, dioecious tree. M.S. Thesis, Florida State Univ., Tallahassee.
- Shinners, L.H. 1962. Synopsis of *Conradina* (Labiatae). Sida 1:84-88.
- Schultz, G. 1987. Element stewardship abstract for *Conradina glabra*. Manuscript, The Nature Conservancy, Winter Park, FL.
- Small, J.F. 1933. Manual of the southeastern flora, p. 801. Chapel Hill, NC.

U.S. Fish and Wildlife Service. 1991. Endangered and threatened wildlife and plants; *Conradina verticillata* (Cumberland rosemary) determined to be threatened. *Federal Register* 56(230):60937-60941. Nov. 29

U.S. Fish and Wildlife Service. 1993. Endangered and threatened wildlife and plants; Endangered or threatened status for five Florida plants [including *Conradina glabra*]. *Federal Register* 58(131):37432-37442. July 12

PART III. IMPLEMENTATION SCHEDULE

The Implementation Schedule that follows outlines actions and estimated costs for the recovery program. It is a guide for meeting the objective discussed in Part II of this Plan. This Schedule indicates task priorities, task numbers, task descriptions, duration of tasks, the responsible agencies, and lastly, estimated costs. These actions, when accomplished, should bring about the recovery of *Conradina glabra* and protect its habitat. It should be noted that not all the estimated monetary needs for all parties involved in recovery are identified and, therefore, Part III reflects only the estimated financial requirements for the recovery of this species.

While the U.S. Fish and Wildlife Service has no power to require other Federal and State agencies to carry out specific actions for endangered species recovery, we believe the designated agencies have the necessary authority to implement the identified tasks. The Implementation Schedule serves to alert those agencies to the need for these actions and to justify seeking funds to carry out the actions.

Priorities in Column 1 of the following Implementation Schedule are assigned as follows:

Priority 1 - An action that must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future.

Priority 2 - An action that must be taken to prevent a significant decline in species population/habitat quality or some other significant negative impact short of extinction.

Priority 3 - All other actions necessary to provide for full recovery of the species.

NOTE: Each task in the Implementation Schedule is assigned a priority number. While the number reflects the importance of the activity, it does not mean that the highest-priority tasks will necessarily be accomplished first.

Abbreviations in the Implementation Schedule:

CPC	Center for Plant Conservation and member botanical gardens
FDACS	Florida Department of Agriculture and Consumer Services, Division of Forestry
FDEP	Florida Department of Environmental Protection, Division of Recreation and Parks
FDOT	Florida Department of Transportation

FWS **U.S. Fish and Wildlife Service, Ecological Services, Division of Endangered Species**

(Note: the new National Biological Survey may eventually play a role in providing scientific expertise for plant recovery projects)

TNC **The Nature Conservancy**

IMPLEMENTATION SCHEDULE

Priority	Task Number	Task Description	Task Duration	Responsible Agency	Cost estimates (\$000)					Comments
					FY 1	FY 2	FY 3	FY 4	FY 5	
1	1.1	Encourage conservation of existing populations on private lands.	ongoing	landowner/manager	2	2	2	2	2	Actual costs of acquiring land by purchase or protecting it through conservation easements is <u>not</u> included here.
1	1.2	Annual population monitoring and mapping.	ongoing	FWS, TNC, FDEP	3	3	3	3	3	
1	1.3	Management of rights-of-way.	ongoing	FWS, FDOT, utilities, county road departments	5	5	5	5	5	
1	1.4	Habitat acquisition.	ongoing	FWS, FDACS, TNC						
1	2.1	Population biology - fire management.	5 years	FWS, TNC	6	6	6	6	6	
2	2.2	Population biology - life history studies.	3 years	FWS, TNC, universities	9	9	9			
3	2.3	<i>Conradina glabra</i> surveys outside its current range.	1 year	FWS	4					
3	3	Genetic studies.	2 years	FWS, universities		10	10			
3	4	Garden propagation and reintroduction.	ongoing/ indefinite	FWS, botanical gardens, CPC	2	2	2	2	2	

PART IV. LIST OF REVIEWERS

Steve Christman
Florida Museum of Natural History
Route 3, Box 2831
Quincy, FL 32351

*Doria Gordon
The Nature Conservancy
Florida Museum of Natural History
University of Florida
Gainesville, FL 32611

Robert McCartney
Woodlanders, Inc.
1128 Colleton Ave.
Aiken, SC 29801

*Angus Gholson
AKG Herbarium
P.O. Box 385
Chattahoochee, FL 32324

Richard Hilsenbeck
The Nature Conservancy
625 North Adams Street
Tallahassee, FL 32301

Reed Crook
Dept. of Botany
University of Georgia
Athens, GA 30602

Eric Menges
Archbold Biological Station
P.O. Box 2057
Lake Placid, Florida 33852

*Greg Seamon
The Nature Conservancy
625 North Adams Street
Tallahassee, FL 32301

*Tammera Race
Bok Tower Gardens
P.O. Box 3810
Lake Wales, FL 33853-3810

Robert Godfrey
Tall Timbers Research, Inc.
Route 1, Box 678
Tallahassee, FL 32312-9712

St. Joseph Land & Development Company
P.O. Box 1380
Jacksonville, FL 32201

*Clay Smallwood
St. Joseph Land & Development Company
P.O. Box 908
Port St. Joe, FL 32456-0908

*Ann F. Johnson
Florida Natural Areas Inventory
1018 Thomasville Rd., Suite 200-C
Tallahassee, FL 32303

Wilson Baker
The Nature Conservancy
625 North Adams Street
Tallahassee, FL 32301

Dennis Hardin
Division of Forestry
Florida Dept. of Agriculture and
Consumer Services
3125 Conner Blvd.
Tallahassee, FL 32399-1650

Natalie Furman
Florida Dept. of Transportation
U.S. Highway 90 East
Chipley, FL 32428

***Guy Anglin**
U.S. Forest Service
325 John Knox Rd., Suite F-100
Tallahassee, FL 32304-4107

***Robin Huck**
Florida Dept. of Environmental Protection
Division of Recreation and Parks
4415 Thomas Drive
Panama City, FL 32408

***Richard Gaskalla**
Florida Dept. of Agriculture and
Consumer Services
Division of Plant Industry
P.O. Box 147100
Gainesville, FL 32614-7100